

CLAIMS

WHAT IS CLAIMED:

- 1 1. A method for utilizing seismic data contemporaneously across multiple seismic
2 domains, the method comprising kinematically linking a first point in a set of seismic data
3 having at least three-dimensions in a first seismic domain with a second point in the set of
4 seismic data in a second seismic domain related to the first seismic domain by a velocity
5 model in time or in depth.
- 1 2. The method of claim 1, further comprising visualizing the first and second seismic
2 domains.
- 1 3. The method of claim 2, wherein kinematically linking the first point with the second
2 point includes linking a cursor in the first seismic domain to a cursor in the second seismic
3 domain.
- 1 4. The method of claim 1, further comprising commonly navigating between the first
2 and second seismic domains over the kinematic link.
- 1 5. The method of claim 1, further comprising interpreting the seismic data.
- 1 6. The method of claim 1, wherein:
2 one of the first and second seismic domains comprises un-migrated post-stack time
3 and the other one of the first and second seismic domains comprises post-stack
4 depth;
5 one of the first and second seismic domains comprises migrated post-stack time and
6 the other one of the first and second seismic domains comprises post-stack
7 depth;
8 one of the first and second seismic domains comprises pre-stack time and the other
9 one of the first and second seismic domains comprises depth;
10 one of the first and second seismic domains comprises post-stack depth and the
11 second seismic domain comprises depth;
12 one of the first and second seismic domains comprises post-stack depth and the other
13 one of the first and second seismic domains comprises re-migrated post-stack
14 depth;

15 one of the first and second seismic domains comprises pre-stack time and the other
16 one of the first and second seismic domains comprises pre-stack depth ;
17 one of the first and second seismic domains comprises raw pre-stack time and the
18 other one of the first and second seismic domains comprises migrated pre-
19 stack time;
20 one of the first and second seismic domains comprises pre-stack acoustic and the
21 other one of the first and second seismic domains comprises pre-stack
22 converted ; or
23 one of the first and second seismic domains comprises a set of four-dimensional
24 seismic data from a first vintage and the other one of the first and second
25 seismic domains comprises a set of four-dimensional seismic data from a
26 second vintage.

1 7. The method of claim 1, wherein the velocity model comprises an acoustic velocity
2 model, an elastic velocity model, being they isotropic or an anisotropic velocity model.

1 8. The method of claim 1, wherein the dynamic conversion mechanism comprises a
2 vertical stretch, zero-offset conversion, image ray conversion, multi-offset conversion, elastic
3 conversion, or four-dimensional conversion type of mechanism.

1 9. The method of claim 1, wherein kinematically linking the first point to the second
2 point includes applying a kinematic conversion mechanism of the same type as the dynamic
3 conversion mechanism to the first point.

1 10. The method of claim 9, wherein the kinematic conversion mechanism comprises one
2 of a vertical stretch, a ray tracing, or an Eikonal wave front reconstruction.

1 11. The method of claim 1, further comprising pre-computing or computing on the fly a
2 kinematic conversion between at least a portion of the data points in the first seismic and a
3 portion of the data points in the second seismic domain.

1 12. The method of claim 1, further comprising kinematically linking the first point with a
2 second point in the set of seismic data in a second seismic domain related to the first seismic
3 domain by a velocity model in time or in depth.

1 13. The method of claim 1, wherein kinematically linking the first point with the second
2 point comprises kinematically linking the first point point-to-point with the second point.

1 14. The method of claim 1, kinematically linking the first point with the second point
2 comprises kinematically linking the first point surface patch-by-surface patch with the second
3 point.

1 15. A program storage medium encoded with instructions that, when executed by a
2 computer, perform a method for utilizing seismic data contemporaneously across multiple
3 seismic domains, the method comprising kinematically linking a first point in a set of seismic
4 data having at least three-dimensions in a first seismic domain with a second point in the set
5 of seismic data in a second seismic domain related to the first seismic domain by a velocity
6 model in time or in depth.

1 16. The program storage medium of claim 15, wherein the encoded method further
2 comprises visualizing the first and second seismic domains.

1 17. The program storage medium of claim 15, wherein the velocity model in the encoded
2 method comprises an acoustic velocity model, an elastic velocity model, being they isotropic
3 or an anisotropic velocity model.

1 18. The program storage medium of claim 15, wherein the dynamic conversion
2 mechanism of the velocity model in the encoded method comprises a vertical stretch, zero-
3 offset conversion, image ray conversion, multi-offset conversion, elastic conversion, or four-
4 dimensional conversion type of mechanism.

1 19. The program storage medium of claim 15, wherein kinematically linking the first
2 point to the second point in the encoded method includes applying a kinematic conversion
3 mechanism of the same type as the dynamic conversion mechanism of the velocity model to
4 the first point.

1 20. The program storage medium of claim 15, wherein the encoded method further
2 comprises pre-computing or computing on the fly a kinematic conversion between at least a
3 portion of the data points in the first seismic and a portion of the data points in the second
4 seismic domain.

- 1 21. The program storage medium of claim 15, wherein the encoded method further
2 comprises kinematically linking the first point with a second point in the set of seismic data
3 in a second seismic domain related to the first seismic domain by a velocity model in time or
4 in depth.
- 1 22. The program storage medium of claim 15, wherein kinematically linking the first
2 point with the second point in the encoded method comprises kinematically linking the first
3 point point-to-point with the second point.
- 1 23. The program storage medium of claim 15, kinematically linking the first point with
2 the second point in the encoded method comprises kinematically linking the first point
3 surface patch-by-surface patch with the second point.
- 1 24. A computer programmed to perform a method for utilizing seismic data
2 contemporaneously across multiple seismic domains, the method comprising kinematically
3 linking a first point in a set of seismic data having at least three-dimensions in a first seismic
4 domain with a second point in the set of seismic data in a second seismic domain related to
5 the first seismic domain by a velocity model in time or in depth.
- 1 25. The computer of claim 24, wherein the encoded method further comprises visualizing
2 the first and second seismic domains.
- 1 26. The computer of claim 24, wherein the velocity model in the encoded method
2 comprises an acoustic velocity model, an elastic velocity model, being they isotropic or an
3 anisotropic velocity model.
- 1 27. The computer of claim 24, wherein the dynamic conversion mechanism of the
2 velocity model in the encoded method comprises a vertical stretch, zero-offset conversion,
3 image ray conversion, multi-offset conversion, elastic conversion, or four-dimensional
4 conversion type of mechanism.
- 1 28. The computer of claim 24, wherein kinematically linking the first point to the second
2 point in the encoded method includes applying a kinematic conversion mechanism of the
3 same type as the dynamic conversion mechanism of the velocity model to the first point.

- 1 29. The computer of claim 24, wherein the encoded method further comprises pre-
2 computing or computing on the fly a kinematic conversion between at least a portion of the
3 data points in the first seismic and a portion of the data points in the second seismic domain.
- 1 30. The computer of claim 24, wherein the encoded method further comprises
2 kinematically linking the first point with a second point in the set of seismic data in a second
3 seismic domain related to the first seismic domain by a velocity model in time or in depth.
- 1 31. The computer of claim 24, wherein kinematically linking the first point with the
2 second point in the encoded method comprises kinematically linking the first point point-to-
3 point with the second point.
- 1 32. The computer of claim 24, kinematically linking the first point with the second point
2 in the encoded method comprises kinematically linking the first point surface patch-by-
3 surface patch with the second point.
- 1 33. A method for visualizing a set of seismic data in multiple seismic domains,
2 comprising:
3 visualizing the seismic data in a first seismic domain;
4 visualizing the seismic data in a second seismic domain, the second seismic domain
5 being related to the first seismic domain by a velocity model in time or depth
6 and an appropriate conversion mechanism; and
7 kinematically linking the first and second seismic domains through a kinematic
8 conversion mechanism of the same type as the dynamic conversion
9 mechanism used to generate the second seismic data from the first seismic
10 data based on the appropriate velocity model.
- 1 34. The method of claim 33, further comprising visualizing the first and second seismic
2 domains.
- 1 35. The method of claim 33, wherein the velocity model comprises an acoustic velocity
2 model, an elastic velocity model, being they isotropic or an anisotropic velocity model.
- 1 36. The method of claim 33, wherein the dynamic conversion mechanism comprises a
2 vertical stretch, zero-offset conversion, image ray conversion, multi-offset conversion, elastic
3 conversion, or four-dimensional conversion type of mechanism.

1 37. The method of claim 33, wherein kinematically linking the first and second seismic
2 domains includes applying a kinematic conversion mechanism of the same type as the
3 dynamic conversion mechanism of the velocity model to the first seismic domain.

1 38. The method of claim 33, further comprising kinematically linking the first and second
2 seismic domains in the set of seismic data in a second seismic domain related to the first
3 seismic domain by a velocity model in time or in depth.

1 39. The method of claim 33, wherein kinematically linking the first and second seismic
2 domains comprises kinematically linking the first seismic domain point-to-point with the
3 second seismic domain.

1 40. The method of claim 33, kinematically linking the first and second seismic domains
2 comprises kinematically linking the first seismic domain surface patch-by-surface patch with
3 the second seismic domain.

1 41. A method for detecting discrepancies in three-dimensional seismic data between
2 multiple seismic domains thereof, comprising:
3 kinematically linking a first seismic domain of the seismic data to a second seismic
4 domain of the data;
5 kinematically linking the second seismic domain to a third seismic domain and
6 comparing the first seismic domain to the third seismic domain over the kinematic
7 link between the first and second seismic domains and over the kinematic link
8 between the second and third seismic domains; and
9 detecting discrepancies between the first and third seismic domains as a consequence
10 of the comparison.

1 42. The method of claim 41, further comprising visualizing the first seismic domain, the
2 second seismic domain, and the third seismic domain.

1 43. The method of claim 41, wherein linking the first and second seismic domains or
2 linking the second and third seismic domains includes employing an acoustic velocity model,
3 an elastic velocity model, being they isotropic or an anisotropic velocity model.

1 44. The method of claim 41, wherein the linking the first and second seismic domains or
2 linking the second and third seismic domains includes employing a dynamic conversion

3 mechanism comprising a vertical stretch, zero-offset conversion, image ray conversion,
4 multi-offset conversion, elastic conversion, or four-dimensional conversion type of
5 mechanism.

1 45. The method of claim 41, wherein kinematically linking the first and second seismic
2 domains includes applying a kinematic conversion mechanism of the same type as the
3 dynamic conversion mechanism of the velocity model to the first seismic domain.

1 46. The method of claim 41, further comprising kinematically linking the first and second
2 seismic domains in the set of seismic data in a second seismic domain related to the first
3 seismic domain by a velocity model in time or in depth.

1 47. The method of claim 41, wherein kinematically linking the first and second seismic
2 domains comprises kinematically linking the first seismic domain point-to-point with the
3 second seismic domain.

1 48. The method of claim 41, kinematically linking the first and second seismic domains
2 comprises kinematically linking the first seismic domain surface patch-by-surface patch with
3 the second seismic domain.

1 49. A method for accumulating complementary information extracted from multiple
2 seismic domains of a set of seismic data, comprising:
3 interpreting a first seismic domain of the seismic data;
4 kinematically linking the first seismic domain to a second seismic domain of the
5 seismic data;
6 seeding the second seismic domain with the interpretation of the first seismic domain;
7 hunting for complementary information in the second seismic domain; and
8 persisting the complementary information to the first seismic domain.

1 50. The method of claim 49, further comprising visualizing the first and second seismic
2 domains.

1 51. The method of claim 49, wherein the velocity model comprises an acoustic velocity
2 model, an elastic velocity model, being they isotropic or an anisotropic velocity model.

1 52. The method of claim 49, wherein the dynamic conversion mechanism comprises a
2 vertical stretch, zero-offset conversion, image ray conversion, multi-offset conversion, elastic
3 conversion, or four-dimensional conversion type of mechanism.

1 53. The method of claim 49, wherein kinematically linking the first and second seismic
2 domains includes applying a kinematic conversion mechanism of the same type as the
3 dynamic conversion mechanism of the velocity model to the first seismic domain.

1 54. The method of claim 49, further comprising kinematically linking the first and second
2 seismic domains in the set of seismic data in a second seismic domain related to the first
3 seismic domain by a velocity model in time or in depth.

1 55. The method of claim 49, wherein kinematically linking the first and second seismic
2 domains comprises kinematically linking the first seismic domain point-to-point with the
3 second seismic domain.

1 56. The method of claim 49, kinematically linking the first and second seismic domains
2 comprises kinematically linking the first seismic domain surface patch-by-surface patch with
3 the second seismic domain.

1 57. The method of claim 49, further comprising:
2 reinterpreting the first seismic domain of the seismic data, including the information
3 persisted from the second seismic domain;
4 kinematically linking the first seismic domain to a third seismic domain of the seismic
5 data;
6 seeding the third seismic domain with the reinterpretation of the first seismic domain;
7 hunting for additional complementary information in the third seismic domain; and
8 persisting the additional complementary information to the first seismic domain.

1 58. A method for improving the exploitation of information extracted from a multi fold
2 seismic data, comprising:
3 kinematically linking a multi-fold seismic domain of the seismic data to an equivalent
4 one fold seismic domain;
5 rearranging the data of the multi-fold seismic domain in light of the information
6 identified in the one fold seismic domain.

1 59. The method of claim 58, further comprising visualizing the multi-fold and single-fold
2 seismic domains.

1 60. The method of claim 58, wherein the velocity model comprises an acoustic velocity
2 model, an elastic velocity model, being they isotropic or an anisotropic velocity model.

1 61. The method of claim 58, wherein the dynamic conversion mechanism comprises a
2 vertical stretch, zero-offset conversion, image ray conversion, multi-offset conversion, elastic
3 conversion, or four-dimensional conversion type of mechanism.

1 62. The method of claim 58, wherein kinematically linking the multi-fold and single-fold
2 seismic domains includes applying a kinematic conversion mechanism of the same type as
3 the dynamic conversion mechanism of the velocity model to the multi-fold seismic domain.

1 63. The method of claim 58, further comprising kinematically linking the multi-fold and
2 single-fold seismic domains in the set of seismic data in a single-fold seismic domain related
3 to the multi-fold seismic domain by a velocity model in time or in depth.

1 64. The method of claim 58, wherein kinematically linking the multi-fold and single-fold
2 seismic domains comprises kinematically linking the multi-fold seismic domain point-to-
3 point with the single-fold seismic domain.

1 65. The method of claim 58, kinematically linking the multi-fold and single-fold seismic
2 domains comprises kinematically linking the multi-fold seismic domain surface patch-by-
3 surface patch with the single-fold seismic domain.